The Earth Science
DIGEST
DECEMBER 1946

MINERALS WANTED

Ward's Natural Science Establishment is in the market for mineral specimens. If you know of any old or forgotten mineral collections, or if you live in a mineralized locality and have excess specimens to sell please write us.

Ward's will pay a fair price for all salable material.

Ward's Natural Science Establishment, Inc.

P. O. Box 24 **Beechwood Station**

ROCHESTER 9, N. Y.

MINERAL SPECIMENS

Also fluorescent and gem material. **Write for our latest list — Our prices will please you.**

FRED ROBERTS, JR.
1106 W. Newmark Ave.
Monterey Park, Calif.

Eden Valley Wood

This wood is from a new field. Sliced 3/16 inch or thin for transparencies at 25c per square inch. Limbs, casts, museum specimens, turritella agate, jaspillite, jade, local ores, etc. Many others.

Write for list.

BIRCH GEM SHOP

Box 75 Atlantic City, Wyoming

I Will Pay

these prices for **METEORITES**, iron or stone, or for any specimen of native (natural) **IRON** (not iron ore but metallic iron) found on the surface or plowed up:

Under 5 pounds	**$ 5 to $ 25**
5 to 25 pounds	**25 to 125**
25 to 50 pounds	**75 to 125**
50 to 100 pounds	**125 to 200**

S. H. PERRY — Adrian, Mich.

We Have Moved

From N. Bonneville, Washington to Maryhill, Washington. We still have our usual selections of nice Agates, Jaspers, Woods, Etc. Also cut sets, cabochon and facet. Slabbed agates, and jewelry. Mail order and retail sales. We invite you to write or visit us.

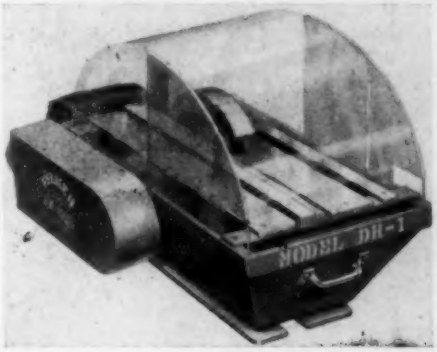
BISHOP'S AGATE SHOP

Maryhill, Washington

Now!

The CUT-OFF SAW

you've always wanted!



FELKER DI-MET MODEL DH-1

CUT-OFF & TRIMMING SAW

Uses 6" or 8" Rimlock diamond blades. All-metal case, chromium plated bed, precision ball-bearing spindle. Coolant is self-contained. Baffles confine churning and splash. Optional plastic cover for greater cleanliness. Precision workmanship throughout. Accurate slice thickness guide.

PRICE, LESS MOTOR
Without plastic cover — $63.50
With plastic cover — $69.25

For descriptive circular, write—

FELKER MANUFACTURING CO.

TORRANCE CALIFORNIA

World's Largest Manufacturer of Diamond Cut-Off Wheels and Equipment.

The Earth Science Digest

Box 57 Omaha 3, Nebraska

Published monthly by
The Earth Science Publishing Co.

R. B. Berry ..... **Editor**
M. R. Humphrey ..... **Associate Editor**
Jerome Eisenberg ..... **Feature Editor**
Ruth Gorham ..... **Circulation & Business Manager**

SUBSCRIPTIONS

Per copy ..... **$ .25**
1 year **2.00**
2 years **3.75**
3 years **5.00**

Advertising rate card will be sent upon request

Vol. 1 December - 1946 No. 5

Cover Photo

Cover photo this month was taken by H. P. Zuidema of the Department of Geography and Geology at Wayne University, Detroit, Michigan. Subject is Mt. Wilbur. The photo was taken through barren trees along Iceberg Lake Trail in Glacier National Park. A check in the amount of $5.00 has been sent to Mr. Zuidema who won first prize in this month's contest. The photo was chosen from the sixteen contest entries.

LAPIDARY EQUIPMENT & SUPPLIES

Horizontal Laps
Diamond Saws
Grinding Arbors
Faceting Heads
Cutting Material
Minerals
Micromounts

Catalog — 10c — Refund on first order.

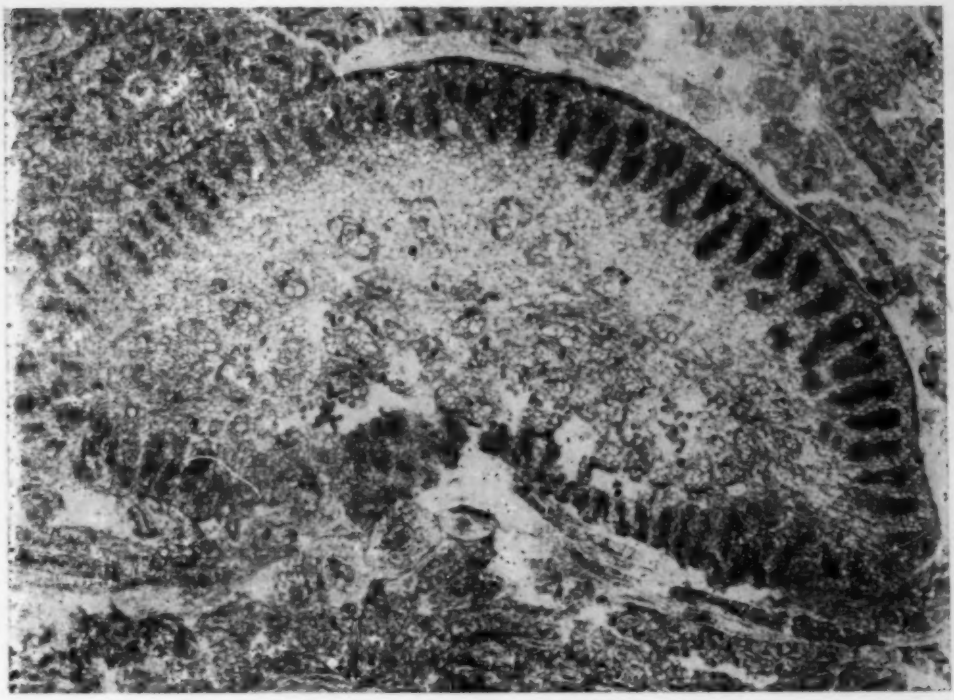
LLOYD M. DEMRICK

1424 Grant Ave.
San Francisco 11, Calif.

Please Mention Earth Science Digest

Contents

Preservation of Plants as Fossils 3
New Books 7
Western Holiday 11
Consternation at Niagara Falls 14
A Few California Locations 8
Agates from Glacial Source 9
Willemites and Calcites of Arizona 10
Elements of Geology — Part 4 18
Report on a Field Trip 15
Letters to the Editor 15
Kristal Kwiz 21



The slightly crushed, petrified leaf stalk of a Seed-fern from an Iowa coal ball

Preservation of Plants as Fossils

Henry N. Andrews, Jr.
Missouri Botanical Garden

There are a great many curious twists in the natural processes occurring in and on the earth that result in the preservation of plants as fossils. The science of paleobotany is a rather young one, having had its origin with the French and English naturalists of a century and a quarter ago, and while we have learned a great deal about the geologic history of our modern floras during this period, much remains to be "dug up". Unfortunately there is much that never will be found since only small fragments of the landscapes of the past have been preserved. Rivers transport an abundant assortment of plant debris which may at last be covered by sediments and preserved. Volcanoes occasionally throw out ash and breccia covering forests, to be preserved in part. Floods, landslides, and such bits of geological violence may play a part, but only in a few instances do we find anything approaching the complete preservation of a flora as it existed in life.

Nevertheless this rather scrappy, scattered evidence of the past has yielded a great deal of interesting information. Fossil plants have told us much about climatic changes of the past; today we know more of the ancestry of the pines and related conifers than botanists of a few decades back would have dared dream about; we know that some of the families of present-day ferns had their origin a quarter of a billion years ago or more; these and

A FOSSIL TREE AT FLOURISSANT, COLORADO

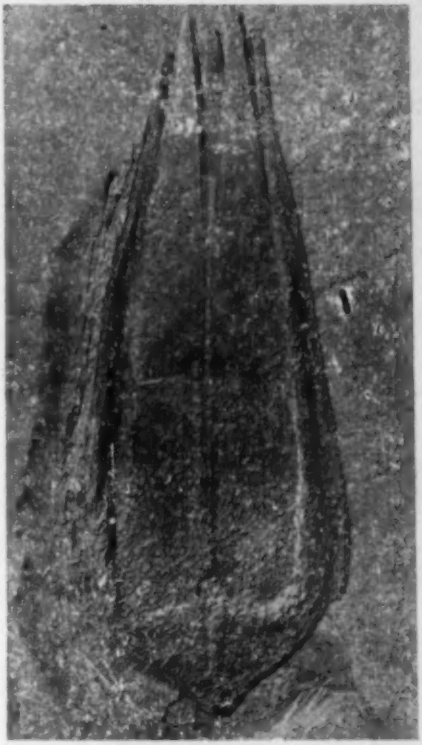
many other discoveries we might recount. But in order to better understand the story of plant evolution itself it is necessary to know how we came by these ancient records - that is, how are plants preserved as fossils? There are three major categories into which we may place fossil plants based on the way that they are preserved.

Impressions: The imprints of twigs, leaves, cones, fruits and the like are included here. These are most commonly found in shales and sandstones and in the typical form none of the original plant matter is preserved. Inasmuch as such fossils preserve only an outline of external form of the original plant there is little for the botanist to go on in the way of identification. Good foliar impressions that show the outline of the leaf and vein system may, however, yield very useful information. Careful studies during recent years of many

Tertiary leaf beds of the Pacific coast states have revealed a clear-cut story of a climate, as far north as southern Oregon, changing from sub-tropical in early Tertiary times to the present temperate climate.

Casts and molds may also be included in this general category. Numerous plants of the past and present have hollow stems such as the living Horsetails and their Coal Age ancestors, the Calamites; and if these are carried to places where rapid sedimentation is taking place the stems are soon filled with mud or sand which is later consolidated into rock. If the stem proper decays we have only the cast remaining. Molds, showing the external form of tree trunks, are to be seen in lava flows such as those at the Craters of the Moon Monument, where the molten rock flowed around standing trees and hardened before the wood was entirely consumed by the heat. As might be expected, such fossils generally tell us little about the ancient plants themselves.

Compressions: When plants, or the scattered fragments of them, are preserved in a very fine-grained sediment, and covered quickly before any appreciable amount of decay sets in, they may be preserved as flattened "mummifications" or compressions. A few years ago we found some Chalk Age (Cretaceous) fern leaves preserved in the fine white shales of the Frontier formations near Kemmerer, Wyoming which were preserved in this fashion. It was possible to dissolve the rock away from them, swell the leaf fragments up somewhat, and see the spore sacs and their contained spores almost as they existed in life some 100 million years ago! We have traced the same fern family back into the Coal Age rocks of Illinois where equally well preserved fossil leaves have been found.



A compressed seed-pod from early Carboniferous rocks

Much of the internal tissue of these compression fossils is crushed beyond recognition but the cuticle (the outer waxy coat commonly present on leaves and fruits) and the outer layer of cells may be very well preserved, along with the contained spores or pollen grains.

Among the most perfectly preserved compression fossils in the world are those from the Yorkshire coast of England. Here, at low tide, one can excavate from a fairly firm clay bed leaves, seeds, and fruits of an amazing array of evergreens, cycads, and other early seed plants. With a little hydroflouric acid the rock matrix is dissolved away leaving the plant remains, black and flattened to be sure, but they can be mounted on paper like modern pressed plants or subjected to further treatment to study such

internal tissues or organs as are preserved.

Petrifactions: With the exception of coal, petrified wood is the commonest "plant mineral" that one encounters in the western states, and for this reason "rockhounds" should be more conversant with the criteria of quality when collecting such specimens with the object of identifying them. Most of this wood belongs to the deciduous (broad-leaf) group. Some specimens can be readily identified but in most instances the fossil woods of deciduous trees cannot be determined without detailed study of thin sections. There are thousands of living species and undoubtedly many that have become extinct - it is not a job for the beginner!

The requirements for good preservation of petrifactions are briefly: the plant must have been covered quickly to prevent decay, and secondly, waters highly charged with minerals must have infiltrated them. We still have a good deal to learn about the process itself but it seems safe to note that the older concept of the replacement of a molecule of cellulose or lignin (the materials composing the greater part of woody tissues) is much larger than a molecule of the common petrifying minerals such as silica or lime; moreover, with petrified wood one may observe that the process starts with the deposition of a layer of mineral around the inside of the individual cell walls. This gradually fills the entire cells and penetrates through the walls without disturbing the structure of the latter.

Contrary to most popular opinion age does not have very much to do with the quality of preservation of either compressions or petrifactions. Wood is abundant in the Chalk Age clays of New Jersey that is very little altered - not being petrified, yet so well preserved as to display the most minute cellular details. Petrified wood has been found in Devonian rocks (dating back some 350 million years) in an almost perfect state of preservation, while vast quantities of the silicified wood of much more recent age in Colorado, Wyoming and other western states is very poorly preserved. This does not, of course, imply that great geologic age is necessary for good preservation! Conditions may vary even in small areas. In a single fossil forest, such at those at Florissant or the Yellowstone, some logs are beautifully preserved (dark in color) while others are very light and with little actual plant tissue remaining. I once took a specimen from Florissant, dissolved out the silica with hydrofluoric acid, and cut the wood on a microtome in the same way that modern wood specimens are handled .... If you want to identify your fossil wood specimens collect only those that are dark, even black, in color, rather than the sandy yellowish or brilliant colored samples.

Scattered through the coal seams of the central states we find, in some mines, rounded masses of petrified plants which, because of their shape, are called **coal balls.** These are aggregations of calcified plants representing fragments of the vast accumulations of vegetation that went into the making of the coal itself. Stems, leaves, seeds, even delicate fungus filaments penetrating the tissues of other plants, are often beautifully preserved in these coal balls.

In the coal itself, such as bituminous coals, the vast aggregations of plant debris that went into its making have been crushed and chemically altered to an almost structureless mass. Occasionally, however, the cellular structure of wood fragments remains; rather

well preserved seeds have been found; and some coals contain abundant and finely preserved pollen grains from a wide variety of plants. Of our three preservation types these recognizable plant remains in coal are best included in the compression category.

Since the question is often asked, it may be appropriate to note that these pollens and seeds in the ancient coals and shales are quite dead — we have no authentic record of seeds, bacteria, or pollens remaining alive for more than 125 or 200 years.

Another question that frequently arises is "How long does it take to petrify a piece of wood?" It is evident that the process varies considerably under different conditions. We do know that wood can remain in good condition for millions of years without any mineralization at all provided that it is quickly covered, being sealed off from the air and organisms of decay such as bacteria and fungi. At the other extreme, logs and twigs taken from the highly charged mineral pools of Yellowstone Park show appreciable mineralization in less than a year's time. In the case of the fossil forests such as those in the Yellowstone an estimate of perhaps one hundred years for complete petrification seems reasonable.

There are, of course, transitional types between these three categories of fossils. Leaf remains in shales often present a thin film of organic tissue remaining — not enough of the leaf to classify it as a compression yet enough so that it is more than just an impression! Likewise, compressions may be partially mineralized presenting an intermediate between the compression and petrification.

There are also other modes of preservation less frequently encountered than these three. Amber, the fossil resin from evergreen trees, may contain fragments of twigs, foliage and even flowers — along with the insects for which it is so famous. In the vicinity of mineral springs, plants, insects, and other organisms may become encrusted with lime, travertine or silica thus creating a stony armor, while in most cases the once living tissue gradually decays away. Such fossils are termed encrustations, although they may be included as molds under the general heading of impressions.

New Books

LEGENDS OF GEMS

by H. L. Thomson, Published by Graphic Press, 4314 Sunset Blvd., Los Angeles, Calif. $1.15.

Legends of Gems tells the story of precious stones through the ages. The book bears heavily on astrological birthstones, amulets, and their occult connections. The book will be of interest to gem-stone hobbyists and commercial cutters. The book incorporates "Gems - How to Know and Cut Them."

"IDENTIFICATION AND QUALITATIVE CHEMICAL ANALYSIS OF MINERALS"

by O. C. Smith. Publ'shed by Nostrand Company, N. Y. $6.00.

When an amateur becomes seriously interested in Earth Science, he soon wishes to identify the material which he collects. Once he learns to make specific gravity and hardness tests the way is made easy by Mr. Smith's first book "Mineral dentification Simplified." Now Mr. Smith comes out with a larger and more complete volume, adapting to his method all known tests,, including blow pipe, bead and ultra-violet.

Visual identification is also made easy by the many color illustrations of the 300 minerals out of the 2,000 and more included in the tables. A fine book of 386 pages, bound in cloth and complete in every way.

A Few California Locations

By DeWitte Hagar

California abounds in locations where interesting rocks may be found, but I shall attempt to cover only a few in this article, hoping that the information may be of value to some who may not be familiar with them.

If you want to have a lot of fun and perhaps pick up a few interesting stones I recommend that you visit Redondo Beach on the outskirts of Los Angeles. I say "perhaps" because it is becoming increasingly difficult to find good stones there lately. There are millions of stones on the beach almost every day — in fact sometimes the beach is actually covered with them to a depth of several feet and for a distance of over half a mile but you have to do a great deal of careful searching to find any that are good enough to polish. Not long ago we could fill a couple of bags with beautiful beach moons, jaspers, agates, a few flower stones and sagenites. Lately, while there are more rocks on the beach than ever, there are very few good ones. But the odd part of it is that, though you find few worthwhile stones, you do have real fun looking for them and dodging the waves. And sometimes the waves require quite a bit of dodging, too. They come rolling in twenty and thirty feet high and with plenty of force in them. Every few minutes someone gets a good ducking and everybody else has a good laugh.

Mint Canyon is a fine place to go in search of rocks. It is about 70 miles out of Los Angeles on the Mojave road. Here are found some wonderful agate nodules. Some are beautifully banded, some run to a very dark, almost blue color with lines and markings, others have crystal pockets. Some make marvelous gem sets and others when cut in two and mounted in pairs make splendid specimens. Then there is a chance you may pick up a few bits of bloodstone — some of it very good, too. There are also nodules of agate with white moss inclusions that are very beautiful.

Of course, the Barstow locality is a rockhound's paradise. At Opal Mountain near Hinckley, just before you reach Barstow, there is a variety of material and some of it is very nice indeed. Then about six miles north of Barstow at Calico is found the famous Calico Jasper which comes in pastel shades and some of it shows pictures of various kinds. I have one piece, given me by a friend, that shows very plainly a dog barking at a cat.

Next comes Mule Canyon just west of Yermo where may be found some wonderful Palm root and a nice sagemite, some of it in large chunks. At Yermo is found the famous pink Palm Root which is very beautiful. As you go on out the road toward Ludlow you pass Lavic where the ground is actually covered with jasper. I had heard about the vast quantity of jasper there but was really thrilled when I discovered how plentiful it really is. The only trouble is that so much of it is full of mineral which makes it difficult to obtain a good polish but if you are careful in your selecting you can get some very beautiful moss jasper of a fine quality which will work up beautifully. At Ludlow you can find moss jasper of various kinds and some of it is really fine.

If you are a hardy soul and a good desert traveler you can visit Afton Canyon, but don't attempt it by yourself. Go in a company of several cars and with equipment to

cope with sand and lots of it. The road has washed out in places and in fact part of a cliff slid down over the road in one spot making it impassable. Then there is always the danger of a sudden flash flood down the washes so it is no place for the inexperienced and ill-equipped. The variety of material to be found there is remarkable, everything from petrified woods of various description to almost anything you want.

Bicycle Lake, Lead Pipe Springs, Muroc Dry Lake, Last Chance Canyon, the Chapinite location, these are all names to conjure with among those who know these places.

The Poppy Jasper from Morgan Hill near San Jose is famous and rightly so, as is the beautiful Breccia Jasper at San Miguel above San Luis Obispo.

The Chocolate Mountains in the Imperial Valley contain beautiful nodules that are well worth seeking, as do the Mule Mountains farther over toward Blythe. These are famous picking grounds for the rockhounds who know that vicinity. Here again you should be equipped to combat the desert unless you want to get into trouble. Of course the Pala district is famous the world over as containing a greater variety of gem stones than any other locality but picking in there is a question of getting permission from the various mine owners of the district and that is not so easy.

These are but a few of the wonderful locations that are available to the lucky folks who can get to them in the state of California.

Gem material, Cabinet specimens, Sawed slabs, Cut stones, Silver jewelry, Flourescent materials, Mineral books, Lapidary, Gold and Silver work to order.

THE COLORADO GEM CO.
Bayfield, Colo.

Agates from Glacial Source

By Louis Grimstead

Gem stone collectors of northeast Missouri can thank the continental ice flows in ages past for providing about their only known source of field material and leaving some really excellent agates in the gravel brought down by these flows.

Near LaGrange, Missouri, in the immense gravel pits owned and operated by the state highway department, agates are readily found in the stock piles. Many of the stones found here are of gem quality and polish satisfactorily. Samples submitted to collectors to the north and west have been declared to be identical with agates found in Michigan and Wisconsin and known as the "Lake Superior" type. This would indicate that the Missouri and the northern stones came from a common source, a belief supported by the fact that the LaGrange deposits are unmistakably of glacial origin.

Some of the agates found here are as finely banded as any the writer has ever seen. Fortification patterns are quite common. While no carnelian has been noted, much material resembling sard has been found.

In addition to the agates, small geodes are quite common in the gravel. Likewise, it is not unusual to expose fossil bones in the work of excavating the gravel.

The Hobby Directory

A new progressive publication in the hobby field is "The Hobby Directory". This directory lists by states the names and hobbies of its members. Editor of the Directory is F. W. Ewing. All inquiries should be sent to: F. W. Ewing, Box 91, South Orange, N. J.

Willemites and Calcites of Arizona

Comparable to the Famous Franklin, N. J. Types — By MaryAnn Kasey

The writer and her husband started out at dawn early in October for a 3-day visit to the State of Texas Mine, owned and operated by Miss Grace M. Sparkes, located in the Hartford Mining District, Cochise County, within a mile of the Mexican Border, and 28 miles west of Bisbee, Arizona.

While in camp, Grace Sparkes had taken us through her mine and, with the aid of an Ultra Violet Ray lamp, displayed to us the splendor of colors when the lamp was directed on the walls and roof of the mine workings, which contain the fluorescent minerals of lime and zinc — Calcite and Willemite.

In addition to the known red-green colors under the U. V. lamp, Miss Sparkes' property also cantains much Calcite which fluoresces banded Mexican-Indian rainbow effects and flaming Cochise reds. Much of her Willemite ore shows beautiful red-green-purple designs suggestive of Chinese silk patterns.

To all fluorescent mineral enthusiasts this is a rare treat and experience never to be forgotten as the only other celebrated locality containing the red-green flouresc-ing Willemite in quantity is at Franklin, N. J., and to which locality we had been several times when residing in the east. There is a difference, however, in the physical form of the Willemite at the State of Texas Mine and that at Franklin, N. J. Willemite occurs mainly as crystal and crystal aggregate at Franklin, whilst at the State of Texas Mine most of it is present as solid, streaky or banded material.

Montezuma Canyon, in which the State of Texas Mine is situated, is one of the many box conyons on the flanks of the Huachua Range at an altitude of 5400 feet. Its total length is about five miles, striking in an east-west direction, with its open end facing the east, so that at sunrise the brilliant glory of the rising sun is a memorable sight as it first peeps over the summits of the distant, eastern peaks and then, in emerging fully flooding the San Pedro valley with dazzling, fiery red and orange color. Though the sides of Montezuma Canyon are relatively steep in the lower reaches and at many points sheer cliffs, it has the suggestion of being a U-shaped glacial valley such as are carved out by slowly-moving glaciers. However, the resemblance may be, this canyon is the result of the erosion and solution of limestone strata which had been intruded and tilted to a steep angle by a rather long, east-west striking limb of what might be termed a granite batholith. Most of this sedimentary, limestone cover has been eroded away, exposing the granite for about a height of 800 feet from the remaining limestone and shale in which the State of Texas Mine is located.

Although this mine is of much interest from the point of view of having the not too common fluorescent zinc mineral, Willemite and other contact-metamorphic minerals such as Franklinite, etc., it is also a steady tonnage producer of commercial, zinc-lead-silver ore as well, and with Miss Sparkes' active management and development, marketing of fluorescent minerals is progressing rapidly.

She has recently established her Montezuma Mineral Village and in addition to the fluorescent minerals, she will feature ornamental and decorative rocks for gardens, fireplaces, birdbaths, etc., and colorful, crystallized minerals such as Azurite and Malachite.

Western Holiday

By Mr. & Mrs. Grand-Girard

Reprinted from "The Pick & Dop Stick," through the courtesy of The Chicago Rocks and Minerals Society

For one not having been far west, it was thrilling experience seeing the very blue sky and the white clouds, clear of smoke and dust, and to travel in the depths of enfolding canyon walls or over the awe inspiring mountain passes.

Our trip had a two fold purpose, one to view the ever changing beautiful scenery, and the other to increase our mineral collection. During the trip, every opportunity was taken to hunt minerals along the highway. The accumulation was not as large as anticipated because of several factors. The area near the highway has been fairly well picked out because of the activities of many collectors in the West. As one becomes acquainted with the natives, one may be directed to nearby, good hunting grounds. We learned, however, that particularly good jaspers and agates were claim staked, and that the good picture wood could be found only by prospecting with pack mules on three day or longer trips into the hills. Hunting along river beds and creek beds was fun even though our collection was not greatly increased, and hunting in the mining areas where one could easily gain permission was acceptably productive. Generally, the shop owners and collectors were friendly and informative. However, we being "tenderfoot" on some occasions had our "leg pulled" a bit. For example, the owner of a beautiful piece of beryl told us that it was harder than a diamond. This same collector had traveled extensively and had many unusual specimens, one or two more interesting than we had seen in a museum or a private collection. One in particular was a magnesium formation bearing a remarkable resemblence to a pine cone.

Scenically, Colorado is known as the Switzerland of America, and mineralogically as one of the richest states. The Rockies are rugged and majestic and hold many recources yet undiscovered. After traveling through the flatter central states, the rolling and mountainous terrain of Colorado presents a striking contrast. At the varying levels of altitude which are quickly covered in mountain traveling, vegetation changes rapidly from heavy forests to barren rock. Flowers are profuse at all but the highest levels, but even there are sometimes seen strange tiny blooming plants, an inch to an inch and a half ...gn.

Mining is done in almost all parts of the state. Much alabaster is mined in the northern and central part, and throughout Boulder Canyon. Idaho Springs is noted for gold mining. As one carefully unwinds oneself from the mountain between Kokomo and Climax, a grand view of the huge Molybdenum mine unfolds. The guards at the entrance were not to be pursuaded and no specimens of "moly" or by-products were obtained.

Leadville has the two largest operating lead and zinc mines now in that vicinity. Nice specimens were found of marshite and martinite on quartz, pyrite crystals, galena and sphalerite. The area near Salida yields much feldspar. Between Montrose and Ouray, where the Uncompahgre River crosses the highway, we stopped and hunted plasma, finding only a few good pieces. The best is found farther

north on the same river, however.

The famous Million-Dollar Highway, a rough narrow high mountain road, is the only road from Ouray south, through Silvertown to Electra Lake. The name implies the cost of building rather than the quality of the road. Being blasted from the rocky mountain sides, the road bed was rocky and had been washed out by the recent heavy rains. There were straight drops of what appeared to be several thousand feet at many unprotected turns. From this highway one sees numerous mines dotting all sides and levels of the mountains, many of them abandoned. Treasure Tunnel Mine, located near Red Mountain (and it's really red) provided us with specimens of quartz with pyrite, chalcopyrite, and peacock ore. The towns of Ouray and Silverton are nestled in the mountains and retain many of the quaint old buildings.

Reaching Durango, after going through the beautiful San Juan Forest, we were escorted to a tourist home by the village policeman in a squad car, as he keeps the list of available tourist rooms. Durango has a rock shop, which has odd and beautiful opalized woods, such as walnut, and which also crafts silver jewelry in the modern mode. Nearly all of the towns one sees on the highways have many jewelry and gift shops, with the emphasis on Indian crafts. While the Indians do beautiful work, it is a pleasure to see the smooth silver work without the Indian die designs, set with the same beautiful woods and minerals in a smart sophisticated manner.

Early morning traveling through small sleepy towns, wooded hills, semi-arid flats, and fields of flowers took us to Mesa Verde National Park. A huge black bear, sitting squashily on the highway surveyed our approach. This mesa-canyon country of Southwestern Colorado holds a beauty all of it's own, with the flat top mesas heavily forested with pinon pines and Utah Juniper trees which are always green. Mesa Verde is the Spanish for "green table".

Located between the Mancos River Valley on the east and Montezuma Valley and Southern Ute Indian Reservation on the west, Mesa Verde National Park is geologically important as a type-locality of mesaverde formation, which consists of Cliff House Sandstone, Menefee Shale, and Point Lookout Sandstone, all of which is underlain by 2,200 feet more of shale, sandstone and limestone of the Mancos formation. All of the formations have been exposed by erosion, and spectacular promontories greet you everywhere. There are at least twelve large canyons and almost as many small ones in the park area. The highest elevation is 8 572 feet above sea level, about 2,200 feet above the surrounding valley.

In addition to the interesting formation, Mesa Verde holds famous archeological features. The story of prehistoric Indians has unfolded through the excavations of a few of the many ruins. These are of three types, the pit house, the pueblo, and the cliff dwelling, each offering strange remmants of ancient cultures. The two major groups of Indians were the "Basket Makers", who lived in the region from the beginning of the Christian Era until about 700 A.D., and the "Pueblos", who came in at that time and remained until about 1300 A.D. The Basket Makers were the first farmers in that region. From the traces in the ruins, it was learned that pottery was unknown to them at first, and baskets were used for all purposes. They lived in caves. Other ruins indicated that these Indians progressed rapidly

and finally began to use a plain pottery. They began to build the pit houses, which were shallow circular pits, with head high roofs of earth supported by four poles. These pit houses were single family dwellings and were generally clustered in small groups, sometimes on Mesa tops and sometimes under overhanging rocks. All had the superstructures destroyed by fire, only the base of the roof supporting poles remaining. There are a few to be seen with the fire hollows, earth storage bins, and grinding stones there provoking comparison to modern house-keeping.

The Pueblos were a different group of Indians, which moved in gradually and merged with the Basket Makers. The Pueblos brought a new type of house construction with them and built rectangular structures of mud blocks, sometimes using also stone and poles. Several houses were joined together, with pit-house-like structtures built in front which served as kivas, the secret ceremonial club rooms used only by the men. More and more these homes were built in cliff recesses, probably for more security, evolving into what we term as Cliff Dwellings. Pottery improved, some pieces were decorated with natural herb dyes and on some of the walls in the cliff dwellings can be seen interesting mural designs, centuries old, so clear and well defined that one might easily believe them to be of recent origin.

The cliff dwellings particularly are well preserved by the natural shelter provided by the overhanging cliff structure and by the naturally dry climate. Ironically, the dissolution of these ancient peoples came about because of the unnatural twenty-four year drought, which began about 1276 A. D., year by year causing crops and water supply to fail. There is no indication that any of the Pueblos were left by 1300 A.D., and the assumption is that they moved south and west along the rivers, the present day Pueblo Indians in New Mexico and Arizona being decendents.

Balcony House, built in 1190 A.D. and occupied until after 1272 A.D. was the most interesting structure to us. One small apartment was ingeniously decorated with designs painted on the walls. The communal "kitchen" had a natural spring in it. Security was insured by approaches through narrow clefts in rocks, ascended and descended by toe holds (small depressions chiseled in the rocks), and a curved rock "doorway" through which no outsider could see, but through which he could be seen by the inhabitants. Ruins of open pueblos on the mesas, where some of the Pueblo Indians lived, are still being excavated. Some of these, like Far View, were three stories high. Culture flourished then as evidenced by more remains of well shaped pottery which was decorated and fired. They decorated cotton cloth, and wove sandals. They made various tools out of stone. The precision and artfulness with which they dressed the building stones and built their walls indicated great intelligence, social cooperation and unity of purpose, as well as pre-building planning. This was lacking in the early dwellings where one building was patched on to the other.

On one of our guided trips, the ranger informed us that the age of original construction and repairs of the ruins could be determined by the age of the trees used in their construction. A hollow bore is taken from the log where it will not show and spoil the untouched ancient appearance, and then the tree ring pattern is studied. The meth-

To page 17

Consternation at Niagara Falls

Benedict P. Bagrowski
1722 So. 22 Street
Milwaukee 4, Wis.

On Friday, September 20, 1946, newspapers reported that a huge portion of the brink of Niagara Falls collapsed with earthquake intensity. This collapse said to have taken place on the American side of the falls and witnesses said that the section of the rock measured 120 feet in length at the top and about thirty feet across at the bottom. Pictures were taken to show the falls "before and after".

About 24 hours later, objective investigations showed that no rock was dislodged at all but that the tremors felt in that area were due to a genuine earthquake. Niagara Falls, therefor, still is substantially the same today as it was on the day preceding the "big event".

Such a happening, however, is not an impossibility so far as future rock collapses from the brink are concerned. In the past, large blocks of rock probably crashed frequently, but few, if any, have occurred in recent times. Studies of the Niagara River and it's falls have proved conclusively that the falls are not a permanent feature, but that they may suffer erosion according to the laws of nature.

To understand this region, one must consult geology which tells us that the falls and gorge are post-glacial in origin some 20,000 to 100,000 years ago. At that time, the glacial waters in the eastern Great Lakes region found a drainage course northward over the limestone plain that determines the topography of western New York. Thus was born the Niagara River, the river which now drains the four upper lakes in its course of 36 miles from Lake Erie. Near Lake Ontario, however, the river reaches the end of the limestone plain upon which it flows and plunges over the limestone cliff or escarpment in a magnificent cataract, so beautful that it is awe-inspiring. After this fall of 167 feet, the river rushes for seven miles through a gorge whose depth is between 200 and 300 feet.

The falls of the Niagara are a classical example of unequal erosion of rock masses which differ in resistance. The plateau or plain over which the river flows is capped by a hard resistant layer of rock, known as the Niagara limestone. Underlying this limestone are soft, easily eroded shales. By gradual disentegration and undermining of the softer shale, the river has chewed its way upstream some 7 miles from Lewiston to the present location of the falls. Obviously, this recession of the falls was accellerated by periodic breaking off of large blocks of limestone rather than a gradual orderly chewing away of the rock. Estimates of a progressive recession indicate that the 7 mile change required at least 7000 years. At such a rate, the falls will be near Buffalo - some 100,000 years hence.

Crystal Models

Crystal models of natural compounds are again available in an accurately cast light metal alloy, patterned from an old, comprehensive, but unused, set of German pearwood originals. For details write to Paul H. Keating, c/o The Colorado School of Mines, Golden, Colorado.

Letters to the Editor

Gentlemen:

Enclosed please find a check for $5.00 for a three year subscription to E. S. D. I take a number of mineral magazines and I like your magazine to the extent of wanting it for three years.

Respectfully,
W. R. Ellington,
Dunsmuir, California

Dear Mr. Berry:

The September issue you sent me is being enjoyed. For the enclosed five dollars please enter a three year subscription for me.

Cordially yours,
Arthur W. Browne,
Mountain View, California

Dear Sirs:

I received the sample copy of E. S. D. which you were so kind as to send and think it is a fine addition to the magazines covering this field. I was most pleased with the article on gem material locations, even though I live in a state not abundant in gem minerals, I still like to know the exact locations where they are found, because some day I might have the opportunity of visiting the localities.

J. B. Everson,
3156 College Ave.,
Indianapolis 5, Indiana

Gentlemen:

I want to thank you for the complimentary copy of the October issue of E. S. D. Enclosed is my check for a year's subscription. I wish to compliment you on this magazine. Localized articles such as the October issue contains are very interesting and I hope you will continue with them.

Yours very truly,
H. T. Daniels,
1106 NW 28th St.,
Oklahoma City 6, Okla.

To page 26

Report on a Field Trip

By Harrell L. Strimple
Bartlesville, Oklahoma

The best way to obtain specimens is to go after them whenever possible. Pride in possession is very well but the satisfaction derived from a successful field trip is unsurpassed. I do not speak in the abstract, today was a half-day holiday — Armistice 1946 — and some two hours ago I returned from such a trip. As I sit in my study, full of satisfaction, the desire to tell of such experience is not to be denied.

Circumstances have not permitted a car since the war but several outcrops are in range with the aid of bus and foot. At 2:40 P. M. I boarded a north-bound Greyhound, rode for twenty-five minutes, then walked to the small outcrop of unnamed shale some 30 feet above the Torpedo sandstone formation (upper middle Pennsylvania Period). Many years ago a tank-dyke (normally an earthen wall built around the site of a large oil storage tank) was cut into the side of a hill so that one portion is actually an outcrop. It is not too difficult to identify natural exposures of the formation but there is never sufficient weathering to produce specimens in appreciable quantities. Even this favored exposure weathers so slowly that about six trips a year are sufficient and not always exciting. It was necessary to be back on the highway by 4:50 P. M. which gave time to work the main portion of the exposure carefully but rapidly.

Fossil fragments, crinoid stems, "iron-clay" nodules, etc. clutter the area so that close observation is necessary. Always, on leaving this outcrop, one has the feeling of having overlooked important specimens and no doubt it happens.

To page 16

Roughly, at least one good specimen of each of the following was found:

Wellera osagensis
Punctospirifer kentuckyensis
Sphaerodoma
Orbiculoidea missouriensis
Atremata sp.
Pseudortoceras sp.
Schozostoma catilloides
Chonetes granulifera
Productus sp.
Astartella varica
Nuclopsis venticosa
Bryozoa
Hustedia mormoni
Lophophyllum profundum
Conocardium (?) sp.
Dentalium subleve
Composita subtilita
Zygopleura sp.
Pharkidonotus percarinatus
Allorisma sp.
Apographiocrinus typicalis
Amphicrinus sp. (Dorsal cup only)
Crinoid root (rare)

There are others but no serious effort has been made to compile or check the above list. That part was only incidental anyway, what was really exciting was the finding of a small beautiful crown (body with the arms attached) of a new crinoid genus that has been under study for several years. This specimen will be the "type" (a standard) for a genus to be described as **Exocrinus.** We have numerous young specimens but this is the second crown that could be termed well developed.

It is the anticipation of such finds that drives the true paleontological student back again and again to the outcrops. Many trips may yield only commonly known specimens but eventually nature will relent and another link placed in the knowledge of prehistoric life.

Lapidary Equipment Co. Testing New Power Feed

According to K. J. Hillquist of the Lapidary Equipment Co. in Seattle, the company has been testing for the past thirty days a revolutionary type of power feed for use on their H-16V Diamond Saw Unit.

"Unlike any other feeding device on the market," says Mr. Hillquist, "this new power feed will **AUTOMATICALLY** adapt itself to the varying hardness of the rock being cut. The exclusive mechanical principles involved guarantee a perfectly smooth cut at the highest rate of speed the saw will handle. Maximum life is thus obtained from the saw blade because it is never subjected to undue pressure which would glaze the edge or strip the set."

This new automatic power feed can be installed quickly and easily on any of the H-16V Diamond Saw Units now in use.

While shortage of materials makes full scale manufacture of this new item difficult, they expect to be in production shortly and will announce prices and delivery through the pages of this magazine.

Also in the testing stage with the Lapidary Equipment Company is a new high speed cut-off and trimming saw said to possess many advantages. Details will be released by the company as soon as the equipment has undergone a prolonged test to which it is now being subjected.

FOSSIL COLLECTORS!

Send dime for our new catalog

OMAHA SCIENTIFIC

Box 1750 **Omaha 4, Nebraska**

New Mineral Society

....The Tuscon Rock & Mineral Society held its first meeting on December 3rd. The meeting was attended by 28 people from several states and a guest from Holland. A temporary advisory board was appointed to draft bylaws and a constitution. The society extends a cordial invitation to all mineral enthusiasts to visit meetings. The secretary of the society is Mrs. Margaret O. Gastelum of 1701 S. 6th Ave., Tucson, Arizona.

WESTERN HOLIDAY

From page 13

odology of determining the exact year a dwelling was built and even repaired is most interesting. It is, of course, well known that the age of a tree is determined by the number of rings and further that the ring width indicates the amount of precipitation for the year in which a given ring was grown. Very clearly are shown the "fat and the lean" year by year.

The problem of determining the age of the cliff dwelling was solved by building up a continuous tree chronology, charting the width of the tree rings on a graph from the present back as far as it was possible to go.

It was easy to start to chart backward chronology for centuries from the amazingly well preserved timbers and logs in the dwellings. It was however much more difficult to build up a series dating from the present to a tree whose rings would dovetail with those that were last cut and used in the ruins of the cliff dwellings. After a number of years of research the last gap was bridged. An expedition to the Showlow Ruin in the pre-Spanish Hopi territory where it was believed very

To page 22

Pocket-Sized Geiger Counter

The world's smallest Geiger-Muller counter has been perfected at the University of California. The conuter, only an inch in length, was developed by Edward Guyon, technician at the University. The counter can be used for indicating raidoactivity in places heretofore inaccessible to conventional devices. It is small enough that it might be placed in the veins of a man or animal to check radioactivity. It may also be used for the investigation of small bore drillings. This will facilitate examination and determination of subsurface deposits of radioactive minerals.

Colorado Carnelian Agate

This beautiful material is offered to the collector and cutter for the first time. It is compact, free of pits, flaws and fracture.

It is a Gem Stone material of the first order. We saw every piece so that we are certain of the beauty of coloring and quality. Today fine Gem Material is rare. Pieces also make outstanding Cabinet Specimens for the collector.

If you are not more than satisfied, send it back and get full refund. $4.00 per lb.

PAN-AMERICAN MINING CO.

Box 146 Bayfield, Colorado

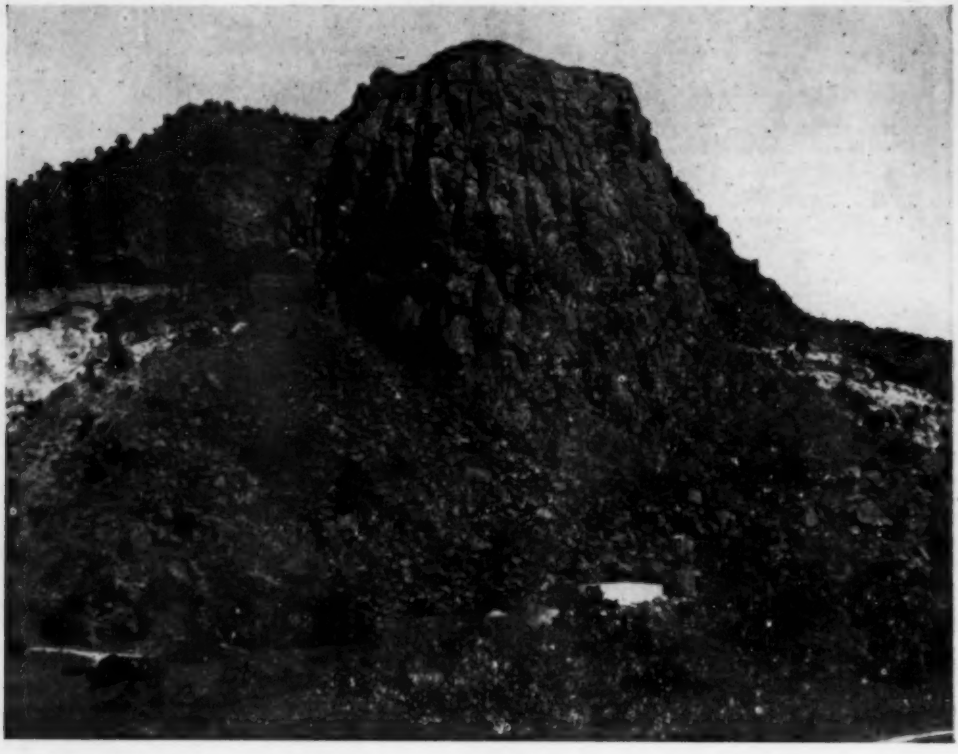
Rough Cutting Material

Oregon Moss Agate - $1.00 lb. Jasper assorted colors, Petrified wood, 50c to $1.00 lb. Montana Agate 50c to $1.00 lb.

Agate Jewelry, Gold or Silver, wholesale and retail. All types of jewelry repairing. We will make up your cut stones to order. Hand made mountings. Myrtlewood Novelties, Custom Cutting.

SOUTHERN OREGON MINERAL EXCHANGE

411 East Main St. Medford, Oregon



Cross section of a volcano exposed by erosion near Lander, Wyoming
Photo by W. D. Keiley, University of Missouri

Elements of Geology

Part 4 — Volcanism

One of the most impressive of all geological phenomena is the volcano. The general concept of a volcano is a steep, conical mountain having a crater at it's top from which rock, lava, gas, and bombs are ejected at intervals. Volcanoes vary in size from a height of a few feet to several miles. The volcanoes of the Hawaiian Islands rise six miles from the ocean floor.

There are several hundred active volcanoes in existance today. New ones are formed occasionally. At birth volcanoes are extremely active, sometimes throwing chunks of rock the size of boxcars hundreds of feet into the air. Steam and smoke oftentimes rise into the stratosphere and are carried around the earth by wind currents. Volcanoes can remain inactive for hundreds of years and then become violently active. A typical case is Vesuvius. This volcano, lying 12 miles south east of the city of Naples, was inactive for many years prior to 79 A. D. but as records show, in 79 A. D. a terrific explosion rocketed the volcanoe back into action. The sky was filled with dust and poisonous gases. The surrounding country side was blanketed with a layer of hot ash. Pompeii with it's 20,000 inhabitants was blanketed with 20 feet of ash. Lives were snuffed out

almost instantly. Over 2000 perished.

The volcano apparently gave no forewarning because excavations have revealed people sitting at their tables in the exact position that they sat down for dinner almost 2000 years ago. One of the sentries of the town was found at the north gate of the city standing upright. He must have remained at his post courageously as the ash buried him where he stood. In this gruesome fashion the culture and mode of life of this Roman city was preserved in the minutest details for almost 19 centuries.

In 1883 an eruption rocked Krakatoa island. Within a short time the eruption and the tidal waves which followed took the terrific toll of 36,000 lives. Almost as disastrous was the eruption of Mont Pelee in 1902. The volcano had emitted poisonous sulfur gases and dust several months prior to the main eruption. On May 8, 1902 three terrific explosions shook the volcano. The second explosion sent a large cloud of hot gas and incandescent rock particles sweeping down the side of Mont Pelee and into the town of St. Pierre. The city was wrecked and soon burst into flame. Within minutes the dust in the air caused a downfall of rain and mud. The whole town was soon buried. The city's 30,000 people were exterminated within minutes.

Major eruptions may occur every few years. Fortunately, however, these eruptions are confined to certain belts on the earth's surface. In most cases these belts are sparsely populated and in some cases the belts lie in mid-ocean.

Hot Springs, Fumaroles and Small Geysers

In volcanic regions there is generally found an abundance of hot springs and fumaroles. Fumaroles are fissures in rock from which steam is emitted under pressure. Hot springs are fumaroles that have been "quenched" by subsurface water. This water then bubbles out of the fissure. If the water is heater sufficiently a boiling spring results. If evaporation in a boiling spring occurs as r a p i d l y as the spring fills, dissolved rock matter in the spring accumulates until the spring becomes a mass of boiling mud. In New Zealand these mud bolis are quite common and baths in the hot mud are supposed to benefit the health.

"Old Faithful - the most spectacular geyser in the United States

Another type of hot spring is the geyser. At intervals they erupt a column of hot water and steam. Some geysers develop cones of silica. The deposit is called siliceous sinter. Geysers are by no means common occurrences. The three known fields are Yellowstone National Park, Iceland, and New Zealand. The action of geysers is not to be easily explained. Geysers usually have a complex subsurface

network of tubes and fissures that collect and transmit water and super-heated steam. Each geyser has its individual characteristics that testify as to the complexity of the activating source.

Revised Lapidary Handbook

— Howard

Is of interest to mineralogists and gemologists as well as to lapidaries.

220 pages

62 line drawings and photographs

The most complete coverage of this subject ever published.

Theory of gem design.

Specific instructions for doing all phases of gem cutting.

With intensive listing of supplies of equipment and material.

Excellent index - Good cloth binding.

Price $3.00

Order from

The Earth Science Digest

Box 57 **Omaha 3, Nebr.**

LAPIDARY GEMS

AUSTRALIAN OPALS — JADE
RUSSIAN LAPIS
"CATSEYE" TIGEREYES: Yellow, Red, Blue-Green.
SAPPHIRES, AQUAMARINE, and others

SPECIAL

Cut to order beautifully faceted hearts, approximately 10 to 20 ct. size, as follows:
CITRINE: (Light golden yellow) **$2.25 per ct.**
AMETHYST: (Fine purple gem) **$2.75 per ct.**

Postage and 20% Federal Exhise Tax Extra

Special prices on wholesale quantities to dealers

Finest professional workmanship on all orders for facet or cabochon cutting

LEE LAPIDARIES

1916 West 75th Street — Cleveland 2, Ohio

BLANK MOUNTINGS

SET YOUR OWN STONES

into jewelry. We will send you selection of blank mountings to select from if reference is given.

Ladies silver rings,	$1.50 each
Ladies 10K gold rings	$4.00 each
Men's silver rings	$2.50 each and $3.50 each
Gold filled (G. F.) or silver brooches	$1.50 each
G. F. or silver pendants with chains	$2.00 each
G. F. or silver lapel pins	$2.00 each
G. F. or silver tie chains	$1.50 each
G. F. or silver bracelets	$2.00 each
G. F. or silver earings	$1.50 pair
Add 20% government tax if not for resale.	
Burnisher for setting stones	$ .75
Ring sticks for measuring rings	2.00
Ring gauges for measuring size of fingers	1.50
Diamond paste and 7 hollow tubes for drilling pendants	2.00
G. F. or silver bails or clevices	$ .25 each

SMITH'S AGATE SHOP

228 S. W. Alder St., Portland 4, Ore.

Lapidary Supplies

for

Immediate Shipment

ALTA belt type sander and polisher - - - - - **-$19.50**

ALTA heavy duty ball bearing Arbor - - - - - **22.50**

ALTA 16 inch diamond saw unit power feed built for fast cutting and long life- - **-127.50**

IDAORE GEM COMPANY

Box 388 **Weiser, Idaho**

KRISTAL KWIZ

Jerome M. Eisenberg

To what crystal system do the following minerals belong?

1. Arsenic: a) hexagonal, b) orthorhombic, c) tetragonal..
2. Brookite: a) isometric, b) orthorhombic, c) tetragonal.
3. Cassiterite: a) siometric, b) orthorhombic, c) tetragonal.
4. Iron: a) hexagonal, b) isometric, c) orthorhombic.
5. Manganite: a) hexagonal, b) isometric, c) monoclinic.
6. Muscovite. a) hexagonal, b) monoclinic, c) orthorhombic.
7. Rutile: a) monoclinic, b) orthorhombic, c) tetragonal.
8. Sphalerite: a) isometric, b) tetragonal, c) orthorhombic.
9. Stibnite: a) monoclinic, b) orthorhombic, c) tetragonal.
10. Topaz: a) hexagonal, b) orthorhombic, c) tetragonal.

Answers on page 24

AUSTRALIAN OPALS — Direct from Australia

BOULDER OPAL SPECIMENS — Brown rock with patches or veins of Blue, Green or Red Colours. Specimens, Blue-green 1" size ..... **25c and 50c each**
Larger or finer specimens ..... **from $1.00 to $2.00 each**
Selected Specimens 2" to 4" sizes ..... **$5.00 to $20.00 each**

Minimum Orders $15.00 — POSTAGE PAID

Sent Parcel Post. Remit by International Post Office Money Order

ALSO — Good Cutting Opal, Light Fire, Green, Blue Colours from ..... **$2.00 to $5.00 oz., and up**

— OUR ILLUSTRATED LEAFLET NO. 48 POST FREE —

Address

Norman E. Seward **2 Studley Avenue, Kew, Victoria, Australia**

GEMOL GEMOL GEMOL

A NEW SOLUBLE OIL FOR SAWING GEM STONES

GEMOL has been tried by many lapidarists and found to be ideal. It is odorless, chemically inert, non-inflammable and water soluble. It does not "mud" because **GEMOL** allows dust to settle quickly. Cleaning of equipment and specimens no longer is a chore. Complete directions on each can. One pint (enough to make 60 pints of solution) costs only **$1.00 plus 20c postage. Try it.**

Rhodes Hickory Hard Felt Wheels — Pure Optical Grade Cerium Oxide
Bay State Grinding Wheels — Pure Diamond Powder

Send 6c in stamps for our new bulletin describing many other items

THE GEMINLAP MART

1722 South 22 Street **Milwaukee 4, Wisconsin**

WESTERN HOLIDAY

From page 17

old timbers would be found was fruitful. This timber dovetailed perfectly with a tree chronology dating back almost to the end of the cliff dweller era, and overlapped the tree rings in logs used in the buildings of the dwellings. This tree which may be considered the Rosetta Stone of our South West began its growth in 1237 and was cut down with stone axes in 1280, and is the most important link in the tree chronology which dates from 700 A. D. The ring pattern of any given timber regardless of the period it was cut can be correlated with the master chart and thereby definite determination can be made of the years of its growth. It is almost like finger printing Old Father Time himself.

While Mesa Verde offered little mineralogically, the tranquility, mystery, and beauty will long be remembered.

Our trip from Mesa Verde National Park to the south rim of the Grand Canyon took us through the Semi-arid Navajo Indian Reservation. Many covered wagons, filled with the families of migratory Indians following their flocks of sheep were seen dotting what appeared to be barren flats or mounds. However, the sheep were grazing as were the horses, while the families gathered in the shade of the wagon.

The colors of the desert rocks were soft rusts and reds, in contrast to the pale greens, pinks, and yellows of the earth, and the dusty green of sage brush.

One of the most interesting towns we passed through was Gallup, New Mexico, the Indian capitol of North America. It was on a Sunday and the Indian squaws wore their long velvet dresses, which they consider the height of fashion, and enormous amounts of attractive silver and turquoise jewelry. Their hair was arranged with a good bit of yarn wound around it. The Indian men were more conventionally dressed, although occasionally one was seen wearing jewelry, including long turquoise earrings, Frequently, we saw Navahos weaving rugs. The wool is cut from their own sheep, carded and spun by hand. Gray, black, and white are natural colors, the reds, yellows, greens, and blues are dyed with herbs and more recently with commercial dyes.

The beautiful varities of pines and profuse flowers in the higher altitudes of Arizona surprised us as we expected much more arid country. The colors and effects of light on the painted desert were beautiful but could scarcely prepare us for the awe inspiring spectacle of the Grand Canyon of the Colorado River. which we first saw from the Desert View Observation Tower.

A visit to the Grand Canyon proves the exception to the rule that anticipation is greater than realization. Much effort has been made through the medium of poetry and prose, paintings and photographs, to explain and give comprehension of the magnitude and beauty of the canyon. All such efforts have proved futile to a greater or lesser degree. One needs to stand on the rim to appreciate its scope and color harmonies, the grandeur of its sculptured forms, temples, pinnacles and towers built to such a heroic scale that they would have been beyond the imagination of the Gods of ancient man. In order to gain a greater understanding and feeling of it all. one should decend the difficult trail to the bottom and there make various exploratory trips. Only then is it possible to

sense the tremendous power of the world's greatest natural wonder. The canyon is both an intellectual and emotional experience.

It is not the intention of the writers to describe the canyon but rather to give a few items of interest regarding its fauna and flora, as well as to briefly outline the geological aspects, for here are exposed rock formations of the earliest geological eras, more prominently perhaps than in any other place in the world.

Standing on the south rim of the canyon at Yavapai Point, the mighty Colorado River will be seen a mile down. From this distance, it appears to be little more than a ribbon, winding its tortuous way along the canyon floor. At the time we viewed it, no movement of its waters could be seen even with the aid of binoculars. In flood stage, however, this is probably not the case as it rages down its course, cutting ever deeper its bed through the rock strata of the Archean Era. Looking closely one may pick out the 440 foot span of the Kaibab Suspension Bridge, which appears to be no larger than a match. The canyon at this point is ten miles in width, however, even across this distance the north rim is easily discernable. The altitude at the north rim opposite is about 8,800 feet.

At these altitudes one may be quite comfortable. The temperature was a cool 78 degrees, whereas, on the canyon floor, the ranger informed us the temperature was about 110 degrees. Trails are open the year round, since snow accumulates only along the rim and down into the canyon no more than a thousand feet. Because of the great range in altitude within and around the canyon, it will be seen that the climatic conditions favor a wide range of plant and animal life. Many species are found in the canyon far from their natural habitat. For example, the coral snake seldom found north of Mexico is found in the canyon. Other species will be found along the north rim, which are not apt to be found much south of Canada. A squirrel, known as the Kaibab, is found on the north rim and no place else in the world. Naturalists are apt to be skeptical when informed that certain species are found there. At such times, Mr. Schellbach, the park naturalist, delights in taking the visitor to his amazingly complete museum containing specimens of the canyon area, to prove their existence.

The Colorado River, the second longest in America, together with rain, frost, and wind cut this greatest example of erosion. This process continues, deepening and widening the chasm. Daily, the river carries one million tons of pebbles and mud to its mouth. The canyon, measured by the rivers course, is 217 miles long, 105 of which is located in the National Park, and varies from 4 to 18 miles in width.

From the rim of the Grand Canyon one sees the record of ages. The rocks formed there are of five great eras; the first and oldest era known, the Archean, in which the original structure was entirely modified by heat and pressure, and in which no evidence of life is found; the second era, the Algonkian, which are only partially altered and which contain some traces of plant life; the third era, the Paleozoic, in which are preserved primitive animals of many types; the fourth era, the Mesozoic, was the age of dinosaurs, and the rocks of this period are the ones that lend color to the surrounding country, including the Painted Desert; the fifth era, the Cenozoic, the age of mammals, is the last and

included volcanic mountains and the stupendous features of erosion.

The granite formed in bands and streaks in the Archean Era, appears white from a distance, but a pale pink from nearby. These granites have a coarse crystalline texture and were formed by the slow cooling of molten masses which were forced into the older rocks from the earth's interior. Had this material cooled rapidly giving no time for crystallization, obsidian would have been formed. Faint traces indicate that this formation was once in a horizontal position. The present vertical position, together with dense crystallization, indicate great depth at the time of their formation, and further indicate that they at one time were the base of mountains, which were eroded down to make a bed for the later eras of rock formation.

In the Algonkian Era, the rocks represent accumulations of sediments thousands of feet thick. The most conspicuous stratum is a mud rock of a brilliant red color. There are layers of limestone, too, which have been identified as algae, the earliest form of life.

Most fossil hunters know more about the Paleozoic Era. In the various periods of the era are examples of reptile, insect, fern, and plant fossils, mostly preserved in layers of this shale. There are more trilobites (crab-like creatures) found than any other species. Corals and shark's teeth are found in such numbers as to indicate that the seas were warm and shallow. There are about thirty five species of fossil plants from that section, which indicate, because of their type, a semi-arid climate prevailed at some time during the era.

"The age of dinosaurs", the Mesozois Era, was so named because it was dominated by large reptiles. Dinosaur means "terrible lizard". One usually thinks of these as a fantastic creature of literature, until one visits a region, such as the Painted Desert near Tuba City, where their three toed tracks can be seen.

The Grand Canyon was "sculptured" during the Cenozoic Era. It was toward the last of this era that man appeared. No rocks were formed during this period as the region was above sea level and the process of erosion began.

Our Grand Canyon may not be as deep as others in the world, but none can match the vastness, ornate sculpture, wealth of color, and inspiring appeal which ours gives to both the geological and non-geological minded.

CHICAGO ROCKS & MINERALS SOCIETY MEETING

The Chicago Rocks and Minerals Society met at the Saugamash Field House on December 14th. A very interesting talk was given by Dr. Howland, head of the Geological Department of Northwestern University. His subject was "Semi-precious Stones" on which he gave us much information. He announced a question period after the lecture and the members kept him very busy for over an hour. It was a meeting which will long be remembered. There was an exhibit of polished cabochons, some of them made into jewelry by the members.

George C. Anderson, Pres.

ANSWERS TO KRISTAL KWIZ:

1, (a); 2 (b); 3, (c); 4, (b); 5, (c); 6, (b); 7, (c); 8, (a); 9. (b); 10. (b).

Index Your Mineral Collection

Use the "Ser-Lap" Mineral Indexing card, complete in every detail and comes in two sizes: 4 x 6 and 5 x 8 inches.

Lithographed on a good card index paper, arranged for easy handling.- Enjoy indexing your minerals and learn as you go. Increase the value of your collection for now and forever.

Approved by leading authorities.

Remember — the better the index, the more valuable the collection.

The same information on each size card, card size being the only difference.

Here are some of the information items:

Specimen Number	Mineral name	Common name
What location from		Who obtained from
Specific Gravity	Hardness	Color
Cleavage	Fracture	Group
Size	Weight	Does it flouresce?
Igneous	Sedimentary	Metamorphic

Several other references you will use.

Made up after a thorough study and by the assistance of leading authorities. A true card record that will be a standard for all types of collectors.

Order by Form number

Form 1246 4 x 6		Form 1248 5 x 8	
100	$1.00	100	$1.50
300	2.75	300	4.00
500	4.50	500	6.75
1000	8.00	1000	13.00

Postal Money Order, checks or stamps.

Index cards and file box prices on request

Address

SERVICE LAPIDARY COMPANY

1308 West 42nd St. **Des Moines 11, Iowa**

LETTERS TO THE EDITOR

From page 15

Sr. Editor,

Com muito prazer acuso o recebimento do exemplar no 1 referente a agosto ultimo, da revista The Earth Science Digest, que v. s. teve a gentileza de me enviar.

Desejando continuar recebendo regularmente tao util publicacao, inclusive o numero 2, do mes de setebro, peco-lhe o obsequio de anotar meu nome como seu assinante.

Para pagamento dessa primeira "subscription" anal estou remetendo, nesta data, a favor de The Earth Science Digest a importancia de U$S 3.00 por intermedio de The Chase National Bank of New York, da cidade de New York.

Aproveito o ensejo para congratular-me com v. s. pela publicacao desse magazine - repositorio valioso de conhecimentos e informacoes aqueles que se dedicam ao estudo e a exploracao da terra.

Saudacoes atenciasas,
David Felinto Cavalcanti,
Professor de Geologia,
Fortaleza, Ceara, BRASIL

CUT AND POLISHED JADE
Ray and Irene Morgan
JADE DEALERS
Box 654 Lander, Wyoming

Gentlemen:

We were recently given a copy of your magazine by a friend, and after reading it have decided to subscribe. Also would like to subscribe for a relative of ours who is as present working in Brazil. He is a rockhound and is very much interested in the material that is found in Brazil. His address and a check for our subscriptions are enclosed.

Yours respectfully,
R. G. Walcher,
Colorado Springs, Colo.

Dear Mr. Berry:

Went to a recent meeting of a Cheyenne mineral club. Among other topics discussed was E. S. D. The general consensus of opinion was that you should set aside a few beans and hire a proof reader.

Culbertson of Casper,
431 E. Twelfth St.,
Casper, Wyoming

Gentlemen:

I am very much pleased with your magazine. It couldn't be better! In the September issue was a letter from Mr. George Gates of Atlanta, Georgia, asking for "more minerals and less fossils". Please keep your magazine an "Earth Science Digest" and not a "Mineral Digest".

Very truly yours,
Robert W. Morris,
508 N. Market St.,
Lisbon, Ohio.

Gold Rings

With agate set $5 00; Tiger Eye, Jade. or Lapis, $7.00. Gold Earrings, one carat stones, sapphire, ruby, spinel at $20 00. Fine faceted ruby - sapphire - spinel, 5 to 8 mm. girdle at $2.50 per carat. Sterling Rings wholesale from $2.00 to $5.00. Sterling brooches $2.50 to $3.00. Sterling pendants $2.25. Topaz step cut styles, finest Brazilian, $1.25 per carat. Amethyst, step cut styles, light, $1.25 per carat, a few dark at $3.00 per carat. Aquamarine, real beauties good blue at $6.50 per carat. Boules — blanks — stepcuts — octagons — etc. all corundums and spinels. Agate types 35 by 27mm stones - $1.25.

C. F. MILLER

Naamans CK. RD., Worth Ave. RFD Boothwyn, Penna.

AGATE

FLAME PLUME
$1.00 PER SQ. IN. — SAWED

CANELIAN MOSS AGATE
50c to $1.00 per pound

Orders $5.00 or over are prepaid.

H. E. CAREY

Prineville, Oregon

W. L. DeVANEY

Manufacturer of Agate Jewelry

TOLEDO, OREGON

Sawing, Polishing Specimens

Cabochon sets of all shapes

What? You can't get that odd sized cabochon mounted because it doesn't fit a factory-made mounting? Why worry? Send it to me. I will make a mounting to fit the set!

STERLING OR SOLID GOLD

All Work Guaranteed Satisfactory.

NEW YEAR SPECIALS

Wulfenite on matrix from Los Lamentos, Old Mexico, **$1.00 to $15.00;** Apple green Californite, **$3.50 per pound;** Water-bubble selenite crystals, $1.00 to **$5.00;** Golden calcite crystal groups **50c to $5.00;** Opal from Mexico — clear, honey-colored, and cherry, in matrix (not fire opal), **25c to $25.00.** Amber calcite from Mexico, **Groups from 10c to $3.00.**
Collectors items: Descloizite, choice specimens, **$1.00 to $7.50;** Higginsite, **75c to $10.00;** Aurichalcite, **$2.00 to $7.50;** Dioptase, **$2.00 to $15.00;** Bisbee Azurite and Malachite, together and separate **$3.00 to $25.00.**

No orders less than $1.00 please. Postage not included.

GEMARTS COMPANY

4286 Marlborough **San Diego 5, California**

Get-Acquainted Listings

STAR QUARTZ. A really good quality gem rough that cuts into fine star cabochons. **$2.00 lb.. Postpaid.**

NEVADA GEM WOOD. Our best selling gem wood. Richly colored, mostly in reds and browns. **$1.75 lb. Postpaid.**

KEWEENAW AGATES. Small gemmy beach agates in many colors, requiring little or no sawing. One pound will give you several dozen **all different** cabochons. **$1.25 lb. Postpaid.**

SWEETWATER AGATES. Selected mossy gem agates in assorted sizes. **Assortment of 12 for $1.00. Postpaid.**

PREFORM SELECTION. Fine ready shaped cabochons all set for you to polish. Mixed gem types from over 35 varieties we have in stock. **40c each. 12 all different for $4.50. 25 all different for $8.75. Postpaid.**

"Revised Lapidary Handbook", $3.00 Postpaid. (Tells how to cut star quartz, too.)

KEWEENAW AGATE SHOP

Henry L. Luoma, Mgr.

28 Vivian St. **Ahmeek, Michigan**

(RADIO HAMS please call W8YFT on 29338 kc. Member Rag Chewers Club)

BRANHAM'S

JADE — Announcing a new stupendous discovery of Jade in Situ; It's hard but still works up easily: all new colors; new texture; not a black speck in a carload speaking of carload, we mean just that; one pound or a carload; the largest known quantity of Jade on the American continent- except Jade Mountain, Alaska. Write for quantity prices but in the meantime try one slice, or one pound. No use to tell you we guarantee everything we sell, you know that. One slice about 12 to 15 sg. in. **$3.50**

JADE — Our regular light green — not the new kind — one nice slice $2.75

GEM WOOD — Our new spectacular "Brilliant Autumn" Gem Wood from from Utah — from a remote district; never before offered for sale to our knowledge; it shows the flaming beauty of autumn leaves. Polishes exquisitely — no fractures. Pound..... **$1.75**

RHODONITE — The most beautiful Rhodonite in America — polishes beautifully — vivid pin curdled in coal — black manganese — solid — no fractures. Pound..... $1.75

VARISCITE — Utah nodule halves and slices — you all know that this material is getting so scarce that it's almost a myth now-a-days. A friend of ours struck a new pocket in what was supposed to be an abandoned diggins; just an accident, we got most of it. It's apple green through blue green. We are offering you one whole pound of this beautiful material for what you would ordinarily pay for one slice. One whole pound of beautiful Variscite for **$4.50**

VARISCITE — Nevada — A Varascite that comes in seams — A Variscite that will polish — a Variscite that you can buy a whole pound of for **$3.00**

CHRYSOCOLLA — Everyone in the rock collecting business knows that this beautiful Gem material has almost disappeared — Stop in Globe, Bisbee or any of the districts where it is found - try and buy some. We were fortunate in picking up some of this material. It's as blue as Arizona's skies. Three nice lumps **$2.50**

TURQUOISE — Sky blue Nevada nuggets — one of the oldest Gem stones — Rich in Indian lore, rich in color, rich in traditions, favorite of the western states, Turquoise is your identfication as a westerner. One nice firm nugget. **$3.50**

To show you our appreciation of your long and continued patronage, we will send you all of the above items, postpaid anywhere in U. S. for $20.00 and each and every one taking the entire deal will, in addition, get one whole pound of our No. 1 high grade Tiger Eye, ten nice Lake Superior Agates, six Geyser fragment Agates and five nice Apache Tears. Anyone wanting the highest grade Tiger Eye separately by the pound we offer it at the low price of $3.50 We can furnish it in any amounts — quantity prices on request. Please do not order less than $3.00 worth and less than the whole lot will require postage.

ALLEN BRANHAM

BOX 562 — LANDER, WYOMING

THE IDAORE GEM COMPANY

Announces

Affiliation with the Cabochon Shop, Nelscott, Oregon, operated by Mr. and Mrs. Graham Horton who will now be located in Weiser, Idaho, and supply the trade with fine gem materials and expert workmanship, as well as a full line of lapidary supplies and equipment.

IDAORE GEM COMPANY

52 East Commercial St.
Box 338
WEISER, IDAHO

Cerium Oxide

Genuine Cerium Oxide $2.50 per lb. postpaid. Carborundum Grinding wheels 6", 8" and 10", Sanding cloth, Findings: Jump rings, silver chain. silver solder, etc.

A. L. JARVIS

Route 2, Box 350, Watsonville, California

Silver Mounting

YOUR GEMS

Wholesale only. Also wholesale agate jewelry. Write for details and prices.

NORTH WEST GEM SHOP

Box 305 Tacome 1, Wash.

Austinite

A zinc arsenic mineral. brilliant white crystals on a brow iron oxide base. This is excellent micromount material. Specimens of thir rare mineral postpaid $1.25

W. T. ROGERS

1230 Parkway Ave. Salt Lake City 5, Utah

Gem Village

Our shop is up, our stock in, and we are busy filling orders from our new 1947 Price List.

Have you seen our new price list?

It's a dandy, using the new Flourescent ink, and the best of our ten years in business.

We list nearly 200 varities of rough slabs, preforms and cut gems. Also the wonderful new Willems Faceting Device, the Gilde Gem Cutter, all kinds of supplies, books, magazines, in short everything needed by the gem cutter.

Drop us a postal today, and a copy will be promptly mailed.
Don't delay, for the edition is limited.

The Gem Exchange
(Gem Village)

BAYFIELD COLORADO

THE
Gem Maker
AMATEURS OR
PROFESSIONALS

HOBBYISTS
or JEWELERS

ALL will find new enjoyment in this different Gem Maker. All necessary lapidary equipment is furnished, including a super-charged diamond blade for sawing, and all wheels for grinding, shaping and polishing. The complete equipment as shown, less motor and belt, for **ONLY $29.50,** f.o.b. Burlington, Wis.

Write today for information and literature on the Gem Maker and Supplies

B & I Manufacturing Co.

BURLINGTON, WIS., DEPT. E.

Colorful Opalite

For bookends, lamp bases or whatever uses are wanted for large work. This can be supplied in large pieces. It takes a high polish. This material is not a re-sell — it comes direct from the mine. It is not sold as mine run however, each piece is selected for colors and designs. Price: 25c per lb. plus shipping costs. Minimum order 10 lbs.

SATISFACTION GUARANTEED OR YOUR MONEY REFUNDED

Vincent Trescartes

Box 465 **Elko, Nevada**

HAWKINS

Jade - Light green. Slabs 50c sq. in.

Jade - Grey Green. Slabs 50c sq. in.

Jade - Dark Green. Slabs 50c sq. in.

Agate, Manganese, Wyoming. Whole pound $1.00

Utah Varascite. The best I have ever seen, pound $5.00

Rhodnite. Pink. Slice 75c

Rhodnite. Pink & Black mottled 75c

SATISFACTION OR YOUR MONEY RETURNED WITHOUT COMMENT

Lawrence Hawkins

Box 271 **Lander. Wyoming**

ARIZONA AGATES

Pink or light Blue Agates, also Jaspers, in the rough ..... **lb. 50c**
Moss, small beautiful pieces ..... **lb. 85c**
Other lovely colored and patterned Agates, Dendritic Fern Jasper in the rough ..... **lb. $1.00 to $5.00.**

SAWN. UNPOLISHED SLABS

Cabinet Agate ..... **sq. inch 20c**
Gem Agates; Starry night and Snowflake Obsidian; Jaspers, etc. ..... **sq. inch 35c to 50c**

Polished half NODULES — 75c to $2.00 each

Thick-walled whole Geodes — some Fluoresce ..... **4 for $1.00**
Exquisite Canadian Gray Gypsum Roses ..... **50c to $2.00**
Apache Teardrops — according to size ..... **15 for $1.00; $2.00; $3.00**

ALSO OTHER MINERAL SPECIMENS — WRITE FOR PRICES

Minimum order $1.00 **Postage EXTRA on all**

MARYANN KASEY, Box 230, Prescott, Arizona

FOR SALE

That famous Plume Agate
The rarest of all gem stones
By the piece, polished, or rough slab.
Will send on approval - state amount
Hurry as this agate is scarce

ART'S AGATE SHOP
7218 4th Ave. So. Seattle, Wash.

Minerals from Canada

Sodalite in three grades, **$1.75, $1.50 and $1.25 lb.**

Perthite, Salmon red with white stripes. **$1.00 lb.**

Amazonstone, green, **$1.50 lb.**

Rose Quartz, in two grades, **$3.50 and $1.50 lb.**

Canerinite, Blue and yellow, **$1.00 lb.**

Chalcopyrite, bright metallic yellow, **$1.00 lb.**

Wood, from Drumheller, Limb sections, some fluorescent **$1.00 each**

Rhodonite, pale pink, deep pink and yellow, **$1.50 lb.**

Wilsonite, lavender, **75c lb.**

Agatized Wood, $1.00 lb.

Bansanite, "Touch stone", beautiful jet black, mine run **$2.00**

Copper Zinc ore, suitable for Bookends, etc.

All prices F. O. B. Banff
Please include postage at rate of 20c per lb.

LLOYD T. MEWBURN
Lapadist
BANFF, ALBERTA, CANADA

Nevada Gems & Minerals

Carnelian Agate	Sulphur
Black Obsidian	Readgar
Cinnabar in Opal	Orpoment
Cinnabor in Chert	Tourmaline
Petrified Woods	Epidote
Jaspers	Nevada Wonder Stone
Turquoise	Chrystalized Spar
	Rhodenite

Rock Garden, Patio and Building Rock by car load lots

Write for wholesale and retail prices

When going through Battle Mountain, stop at the Nevada Hotel and see our display.

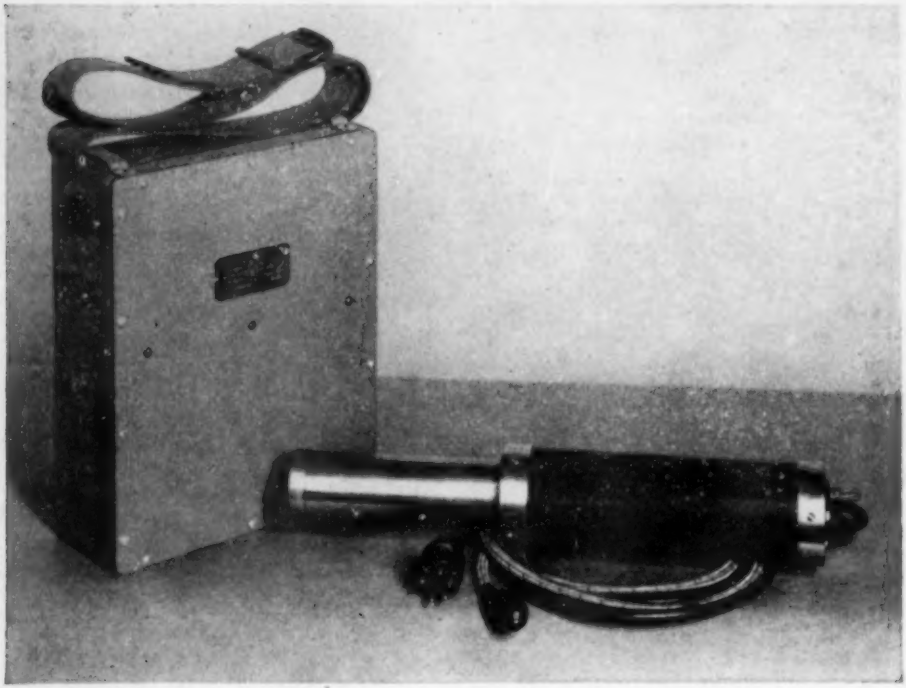
C. A. HOLLIDAY
Battle Mountain, Nevada Box 234

Attention Rock Collectors Everywhere!
Let's make a date to meet at the
KEN-DOR ROCK ROOST
419 So. Franklin St.
Modesto, Calif.
VISITORS ARE ALWAYS WELCOME
We buy, sell or trade mineral specimens

EARRINGS

Something new and different
Sterling silver and gold plate
Price per pair $2.00
All tax included
Special prices to dealers
Ideal Christmas gift

ART'S AGATE SHOP
7318 4th Ave. South, Seattle, Wash



GEIGER COUNTER FIELD UNITS

We can now furnish three models of these field units. The price range is as follows:

Model GLP-213 . . . $145.00
Model GLP-215 . . . $185.00
Model GLP-216 . . . $175.00

Model GLP-214 is equipped with headphones for checking Gamma ray intensity by audible "clicks". Model GLP-216 is equipped with a rate meter. This makes possible quantitive computation of comparative radiation. Model GLP-215 is furnished with an electro-mechanical recording clock. All units will detect radiation equivalent to that emitted by .00002 milligrams of radium. This is the least amount of radiation that can be detected.

HOW TO ORDER

Mail check or M. O. for unit plus postage to cover shipment of twenty-five pounds. Unit will be forwarded within forty-five days after receipt of order. Orders will be filled in the sequence in which they arrive.

OMAHA SCIENTIFIC SUPPLY CO.

P. O. BOX 1759 **OMAHA 4, NEBR.**

CLASSIFIED ADVERTISEMENTS

Rate 5c per word. Minimum advertisement $1.50. All ads must be in our office on the tenth of the month preceeding date of issue.

GEMS & MINERAL SPECIMENS

SPECIAL: 2 pounds of colorful Oregon beach gem cutting agates and jaspers - $1.25 per lot postpaid. Thunder eggs 50c per pound plus postage. Less in larger quantities. Polished halves from $1.00 up. Sawed but not polished 75c. Petrified wood 50c lb. Will do your diamond sawing 10c per square inch. **Lee Stradley, 8325 S. E. Mill St., Portland 16, Oregon.**

GEM CUTTERS! Beautiful Agatized wood. Many colors. two pounds for $1.00. 30c postage. Also Fossil Grass and large Selenite crystals at same price per pound. Write: **L. Manning, Hettinger, North Dakota.**

SPECIAL—10 Arizona Mineral Specimens, geode, thunderegg, etc. $1.00 F. O. B. Please send cash with order. **L. E. Baggs, Box 782, Peor'a, Arizona.**

Send for FREE beautiful agate. Write us what type of polisher you have available. **Box 313, Casper, Wyoming.**

EDEN VALLEY PETRIFIED WOOD — Limb sections ½ to 7 inches in diameter with agate markings. Cane (Rare) shows leaf markings and designs. Fern Fronds, Blackwood, Palmwood, Opalized wood in several colors. Algae, black and brown. **ED SASS AND JOHN HENDRESCHKE. FARSON, WYOMING.**

OREGON CUTTING NODULES and chunks Priday and Antelope agates, jasper wood, other material — Color, variety, quality. 5 lbs., $3.50; 10 lbs., $6.50. All postpaid. **Thomas J. Bones, 2713 Rossiter Lane, Vancouver, Washington.**

RELICS, PREHISTORIC, ETC.

4 very fine ancient Indian Arrowheads, $1.00; 4 tiny perfect bird arrowheads $1.00; 1 Ancient Stone Tomahawk $1.00; 2 Flint Skinning Knives $1.00; 1 Large Flint Hoe $1.00; 2 Spearheads $1.00; 10 Arrowheads from 10 states $1.00; 20 damaged Arrowheads $1.00; 10 Fish Scalers $1.00; 10 Hide Scrapers $1.00; 4 Perfect Saw edged arrowheads $1.00; the above 11 offers $10.00 Postpaid. **List free. LEARS, Box 569, Galveston, Texas.**

I carry a fine stock of ancient stone relics. Also have fossil such as trilobites, ferns in pairs, etc. Some antique firearms in stock of the rarer types. **N. E. Carter, Elkhorn, Wisc.**

WANTED — U. S. gold coins. Indian peace pipes with long stems, especially those with inlaid bowls. Silver crosses given the Indians in early days. Indian silver peace medals. Good prices for any of items listed. **N. E. CARTEM, ELKHORN. WISCONSIN.**

COLLECTORS DO YOU HAVE THESE? Elba Iron - Death Valley, approx. $1.00 per pound. Calcite Xtals - Mexico, beautiful clumps, cream, brown, and black crystals mixed. Flouresces red on breaks. Approx. $1.50 per pound. Descloizite - Mexico, approx. $2.00 per pound. Adamite - Mexico, bright green crystals on brown limonite, 1 in. by 1 in. 40c. Specimens up to $8.00. Specimens will be sent for any amount received but please include postage. We always have cabachons on hand or will make them any size or shape. When ordering by mail, roughly draw size, shape and depth. Satisfaction guar. on everything mailed from our shop. **Valley Art Shoppe, 21108 Devonshire Blvd., Chatsworth, Calif.**

FORTIFICATION AGATE — Small slabs equal to 10 square inches $1.00 postpaid. Many beautiful cabachons can be made from this material. **C. W. SMITH, BOX 422, ALBANY, OREGON.**

ROCKY MOUNTAIN MINERALS — Classified and mounted in attractive box, 24 one inch specimens-$1.50; 18 one inch specimens-$1.00; 15 ¾ inch specimens_75c; Postage prepaid. If you want good showy minerals at moderate price, write for list. **Black Hawk Trading Post, Black Hawk, Colorado.**

JEWELRY ACCESSORIES. Findings, Plastic and metal pinbacks, screw eyes, ear wires, clasps, chains, rings, pearls, cameos, stones, etc. Assortment $1.00. Prompt shipping service. Lists 10c. **Write: Doremby Co., Chisholm 1, Maine.**

BOOKS AND MAGAZINES

THE HOBBY DIRECTORY — A descriptive registry for all male hobbyists (qaurterly service). Contact your "hobby" neighbors in other states and abroad. For complete information write, **Box 91, So. Orange, N. J.**

EASY INSTRUCTIONS for cutting and polishing cabochons with a description of the necessary equipment - sent postpaid for $1.00. **Western Lapidary Supply Co., 117 - 23rd St., Manhattan Beach, Calif.**

METEORITES

I will PAY HIGHEST PRICES for meteorites, iron or stone, or any specimen of native (metallic) iron whether believed to be meteoric or not. **S. H. Perry, Adrian, Michigan.**

FOSSILS

SPECIAL: An assortment of fossils from the Badlands of South Dakota, for $1.00. Also Badlands Opal in the rough at $3.00 per pound. All orders postpaid. **Thomas H. Haskell, Jr., Box 75, Wasta, S. D.**

FOSSIL COLLECTORS — I would like to contact fossil collectors all over the country for trading purposes. I am not a dealer. Write: Robert W. Morris, 508 N. Market St., Lisbon, Ohio.

INTRODUCTORY OFFER — 30 FOSSIL SPECIMENS, including 10 species of Pennsylvanian sea life for only $1.00! Write: **H. L. Strimple, Box 94, Bartlesville, Oklahoma.**

FOR SALE OR EXCHANGE

For Sale: Used 20 inch Diamond saw outfit. Has cross feed for slabbing. Price $100.00. Combination 4 x 12 inch drum and double 10 inch disc sander, $20.00. **A. E. Davies, Box 93, Alamo, California.**

WILL TRADE ARIZONA mineral specimens. What have you to offer? **Write, Mary Ann Kasey, Box 230, Prescott, Arizona.**

FRANK LYMAN SELLS fine shell specimens for collections. Scientific names, exact locality, etc. supplied. Publisher of "Shell Notes". **Address: Frank Lyman, Lantana, Florida, U. S. A.**

WONDERLITE ULTRA VIOLET BULBS, best low priced bulbs on the market, fits any standard electric light socket, long life, for 105-120 volts, 300 watts, A. C. or D. C. $2.60 postpaid anywhere in United States. **H. STILLWELL & SON, Rockville Centre, N. Y.**

MAGI CHEM — Protect and personalize your valuables with MAGI CHEM. The writing stays permanent. Put your trademark on your silverware, jewelry, on key tags, key rings, lighters, tools. This Metal Ink writes as ordinary ink on any metal. MAGI CHEM is ideal for protecting checks, legal documents, stocks and bonds, etc. MAGI CHEM is waterproof, forgery proof; erasure, ink eradicators or chemicals will not alter. Order your MAGI CHEM now. Only $1.25. Postpaid. **NATIONAL DISTRIBUTORS, 808 W. Lakeside Place, Chicago 40, Illinois.**

LEARN THE JEWELRY MANUFACTURING TRADE at home. Excellent profits, pleasant work. Easy illustrated course teaches custom and production jewelry making, goldsmithing, gem setting, repairing, etc. Catalogue. **The GEMCRAFTERS, Dept K., Kalispell, Montana.**

Attention — AGATE DEALERS

Have colorful gem agate slabs weighing from 5 up to 100 lbs. each. Very solid material. Prices and description upon request. Wholesale prices on decorative rocks in 100 lb. lots.

MARY ANN KASEY

Box 230 Prescott, Arizona

BEFORE YOU BUY ANY LAPIDARY EQUIPMENT Send for our

FREE CATALOG

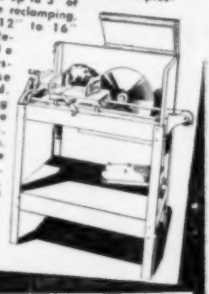
The Famous HILLQUIST LINE OF LAPIDARY EQUIP.

Hillquist LAPIDARY UNIT

DOES EVERYTHING: Sawing, Grinding, Sanding, Polishing, Lapping. Sphere Cutting and Faceting! More than 2,000 in use by amateurs and professionals. Saws up to 10" can be used. Standard Unit includes 8" saw, two lapidary grinding wheels, all-metal combination sander, polishing buff, rock clamp, coolant feed, belt and motor pulley, lapidary pliers, dopping wax, dop sticks, etc. $110.00 f.o.b. without motor or stand. Crating, $3. Ship. Wgt., 100 lbs.

Hillquist SAW UNIT

Years ahead of any other saw unit! Cuts rock up to 7" x9" x18". Quick-action clamp grips rock with hundreds of pounds pressure. Slabs up to 3" of rock before reclamping. Handles 12" to 16" blades. Removable sump. Pressure grease lubricated. Extra long babbitt sleeve bearing. $97.50 f.o.b. without blade or motor. Crating, $3. Ship. Wt., 150 lbs.



Hillquist DRUM SANDER

Change sanding cloth in 10 seconds! Special design (pat. pend.) locks cloth with a twist of the wrist! Used for both sanding and polishing. ALL METAL.

Perfectly machined and balanced. Two sizes, 2"x 7" at $5.00 and 3"x7" at $6.00 for 1/2", 5/8" or 3/4" arbor. State size. Ship. wgt., 4 lbs.

Hillquist FACETOR

Professional model. Fits any horizontal lap with simple adaptor socket or used with Hillquist LAP UNIT shown above. Cuts all types of faceted gems. The finest precision facetor made at a price you can afford. Only $29.00 f.o.b. Ship. Wgt., 9 lbs. Adaptor Socket $2.00. Ship. Wgt., 2 lbs.

Hillquist DIAMOND SAWS

Dollar for dollar, Hillquist Superspeed Diamond Saws give you more for your money because they last longer and cut faster. Order today and see for yourself.

Size	Shipping Weight Lbs.	New	Your Blade Recharged
7"	1½	$ 4.75	$ 4.00
8"	1½	5.75	4.75
10"	2	7.85	6.85
12"	2½	9.50	8.25
14"	3	11.75	10.00
16"	4	13.50	11.50

Hillquist GEM DRILL

Drills finest holes and saws disks up to 2" diameter automatically. Exclusive rewind action (pat. pend.) prevents core from plugging drill. Does half hour's work in ten minutes. Now you can make beads, buttons, earrings, bracelets, etc. $68.80 with 4 drills f.o.b. Crating, $1.00. Ship. wgt., 25 lbs. Button discs can be sawed in less than one minute by using pressure lever supplied with unit.

Lapidary EQUIPMENT CO. INC.

NATIONS LARGEST MANUFACTURERS OF FINE GEM CUTTING EQUIPMENT

1545 WEST 49th ST. SEATTLE 7, WASH.

ARIZONA AGATES, JASPERS, PETRIFIED WOOD

DECEMBER 1946 is here and my fine gem stock is ready. Send your orders in early and they will be filled at once.

We have fine Arizona petrified wood in number one gem agate with real pictures throughout each chunk. This comes in all colors, black in white, black in red, etc. We also have some rich high color gem agate petrified wood with all colors mixed through. This wood can be cut across the grain or with the grain to make beautiful gems, ash trays, book ends, etc.

PETRIFIED wood sold in sliced orders as follows:

Fine picture gem 75c to $15.00 per square inch.
Rich high color wood from 50c to $10.00 per square inch, depending on the picture.
25 square inches of fine mixed number one gem slices, $26.00 postpaid.

RICH high color petrified wood in mine run is $3.00 per pound; 5 pounds, $12.00; 10 pounds, $20.00. Large discount will be given on large contract orders only.

ARIZONA agates and jaspers come in many beautiful rich, deep colors with flowers, ferns, moss, some plume and pictures sold in slices and priced as follows:

Real rich colored flower agate $3.00 per square inch in slices
Rich colored moss agate $2.00 per inch
Mixed colored agate $1.00 per square inch
25 square inches of mixed sliced gem agates and jaspers $26.00 postpaid

MINE run Arizona agate, jaspers and petrified picture wood in rich high colors is $5.00 per pound; 5 pounds $20.00; 10 pounds $35.00. Flower and plume sold only in slices. There will be some flower and fern mixed with the moss in some chunks. When we sell rough gem material we do not saw the choice out.

CHUNKS and ends with one sawed surface are 10 for $10.00. These come mixed in jaspers and petrified wood. Chunks of polished petrified wood agates and jaspers around ½ pound at $2.00 each postpaid.

SMALL and large chips of Arizona agate, jaspers and petrified wood are 10 for $3.00; 20 for $5.00; 50 for $10.00; 100 for $18.00; 5 pounds for $12.00; 10 pounds $20.00. State which you want when ordering — agates, jaspers, or petrified wood.

— SATISFACTION GUARANTEED —

Postage, Express, Freight extra

CHARLES E. HILL

2205 N. 8th STREET **PHOENIX, ARIZONA**

SUBSCRIBE NOW!

We still have a limited number of copies of the later issues of The Earth Science Digest that we will be glad to send to new subscribers.

Rates are as follows:

1 year - - - - - - - $2.00

2 years - - - - - - - $3.75

3 years - - - - - - - $5.00

Mail all subscriptions to:

The Earth Science Digest

P. O. Box 57 **Omaha 3, Nebraska**

Use MINERALIGHT

. . . for pleasure
. . . for beauty
. . . for research
. . . for profit

MINERALIGHT literally adds another dimension of untold beauty to mineral and gem collections . . . enables the scientist to establish mineral identities quickly and accurately by flourescent color response . . . materially aids prospectors and hobbyists in the field to identify many minerals, such as Scheelite, Mercury, Uranium, Zircon, at a glance.

Send for 16 page, 4 color catalog and learn how this ultra-violet (black-light) lamp permits flourescent analysis . . . at home, in the laboratory and in the field!

SAVES TIME AND COSTLY ASSAYS

And MINERALIGHT enables geologists to determine oil content of fresh cores and rotary mud on sight! It, literally, has thousands of uses! 16 MINERALIGHTS in 5 MODELS . . . 110 Volt A. C. lamps for laboratory use . . . 6 Volt battery lamps for field use.

See your nearest MINERALIGHT dealer or write to:

ULTRA-VIOLET PRODUCTS, INC.

5205 Santa Monica Blvd. — Dept. ISD — Los Angeles 27, Calif.

THE ANSWER TO YOUR GIFT PROBLEMS

A

BIG

BARGAIN

100 SHEETS

100 ENVELOPES

Name and Address

Printed in Bright Blue Ink

QUALITY WATERMARKED BOND—ATTRACTIVELY BOXED

SEND ONLY $2.00

Wrights Stationery

P. O. BOX 688 OMAHA 1, NEBR.

STERLING SILVER

SHEET WIRE CHAIN FINDINGS

The FEATHERWEIGHT
Micro Facet Head

Designed and built by an expert gem cutter, this facet head is built for fast and accurate cutting. It is built of rust resisting materials and is finished in colors of silver and black and will harmonize with its surroundings.

$29.50

Diamond charged lap for polishing sapphire and ruby	$7.50
Nickel Silver Earclips - 20c pair	dozen $1.00
Oval bracelet mandrels	each $6.00
Indian design stamps	each $1.25
Sterling stamps	$1.50
Lucite laps	$4.20

ALL PRICES F. O. B. LOS ANGELES

R. & B. ART-CRAFT CO.

11017 SOUTH VERMONT AVENUE LOS ANGELES 44, CALIF.